DATA SHEET

Part No.	AN26018A
Package Code No.	SSMINI-5DC

Contents

AN26018A

LNA IC for UHF Band (400 MHz to 800 MHz) Applications

■ Overview

- AN26018A is LNA-IC for UHF Band (400 MHz to 800 MHz) Applications.
- Realizing high performance by using SiGe Bi-CMOS process (f_T = 90 GHz, f_{max} = 140 GHz).
- High/Low Gain-mode is changeable, controlled by integrated CMOS logic circuit.
- Achieving miniaturization by using small size package.

■ Features

- Low voltage operation +2.85 V typ.
- Low current consumption 3.0 mA typ. (High-Gain mode)
  0.1 µA typ. (Low-Gain mode)
- High gain 14.5 dB typ. fRX = 620 MHz (High-Gain mode)
- Low noise figure 1.50 dB typ. fRX = 620 MHz (High-Gain mode)
- Low distortion –8.0 dBm typ. fRX = 620 MHz (High-Gain mode)
  (IIP3 +10 MHz offset)
- Small package

■ Applications

- UHF Band (400 MHz to 800 MHz) Applications

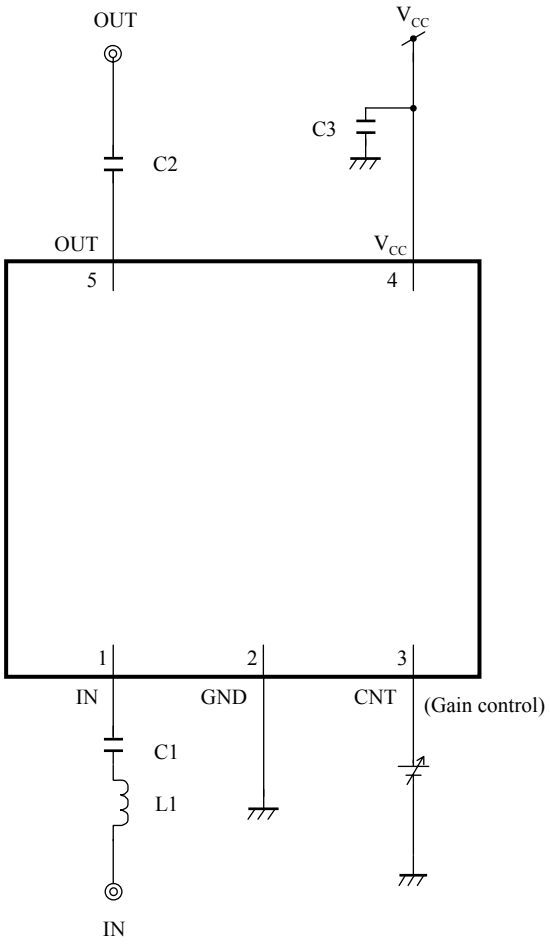
■ Package

- 5 pin Plastic Small Surface Mount Package (SMINI Type)

■ Type

- Bi-CMOS IC

■ Application Circuit Example (Block Diagram)



Notes) • This application circuit is shown as an example but does not guarantee the design for mass production set.
• This block diagram is for explaining functions. The part of the block diagram may be omitted, or it may be simplified.
• External components : See page 15

■ Pin Descriptions

Pin No.	Pin name	Type	Description
1	IN	Input	RF Input
2	GND	Ground	GND
3	CNT	Input	High-Gain / Low-Gain SW
4	V_{CC}	Power Supply	V_{CC}
5	OUT	Output	RF Output

■ Absolute Maximum Ratings

Note) Absolute maximum ratings are limit values which are not destructed, and are not the values to which operation is guaranteed.

A No.	Parameter	Symbol	Rating	Unit	Notes
1	Supply voltage	V_{CC}	3.6	V	*1
2	Supply current	I_{CC}	18	mA	—
3	Power dissipation	P_D	66	mW	*2
4	Operating ambient temperature	T_{opr}	–20 to +70	°C	*3
5	Storage temperature	T_{stg}	–40 to +125	°C	*3

Notes) *1 : The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

*2 : The power dissipation shown is the value at T_a = 70°C for the independent (unmounted) IC package.
When using this IC, refer to the • P_D-T_a diagram in the ■ Technical Data and design the heat radiation with sufficient margin so that the allowable value might not be exceeded based on the conditions of power supply voltage, load, and ambient temperature.

*3 : Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for T_a = 25°C.

■ Operating Supply Voltage Range

Parameter	Symbol	Range	Unit	Notes
Supply voltage range	V_{CC}	2.70 to 3.00	V	*

Note) * : The values under the condition not exceeding the above absolute maximum ratings and the power dissipation

■ Allowable Voltage Range

Notes) • Allowable current and voltage ranges are limit ranges which do not result in damages to this IC, and IC operation is not guaranteed within these limit ranges.
• Do not apply voltage to N.C. pins.
• Voltage values are with respect to the GND.
• Applying external voltage to any pin not mentioned below leads to the malfunction and the damage of the device.
• Below ratings are specified for prevention of malfunction and stress, not for guaranteed operation.

Pin No.	Pin name	Rating	Unit	Notes
1	IN	—	V	*1
2	GND	0	V	*2
3	CNT	–0.3 to (V_{CC})	V	—
5	OUT	–0.3 to (V_{CC})	V	*3

Notes) *1 : RF signal input pin. Do not apply DC current.
*2 : Same as GND pin.
*3 : RF signal output pin. Do not apply DC current.

■ Electrical Characteristics at V_{CC} = 2.85 V

Note) T_a = 25°C±2°C unless otherwise specified.

B No.	Parameter	Symbol	Conditions	Limits			Unit	Notes
				Min	Typ	Max		
DC electrical characteristics								
DC-1	Supply current HG	$I_{CC}H$	V_{CC} current at High-Gain mode No input signal	—	3.0	4.0	mA	—
DC-2	Supply current LG	$I_{CC}L$	V_{CC} current at Low-Gain mode No input signal	—	0.1	9.5	µA	—
DC-3	Input voltage (High-Gain mode)	VIH	—	1.40	2.85	—	V	—
DC-4	Input voltage (Low-Gain mode)	VIL	—	—	0.0	0.55	V	—
DC-5	SW current (High)	IIH	Current at CNT pin VIH = V_{CC}	—	11	40	µA	—

■ Electrical Characteristics (continued) at V_{CC} = 2.85 V

Note) T_a = 25°C±2°C, fRX = 620 MHz, PRX = –30 dBm, CW unless otherwise specified.

B No.	Parameter	Symbol	Conditions	Limits			Unit	Notes
				Min	Typ	Max		
LNA AC electrical characteristics								
A-1	Power Gain HG	GHS	High-Gain mode f = fRX	12.5	14.5	16.5	dB	—
A-2	Power Gain LG	GLS	Low-Gain mode f = fRX, PRX = –20 dBm	–2.0	–1.5	—	dB	—
A-3	IIP3 +10 MHz offset	IIP31S	f1 = fRX + 10 MHz f2 = fRX + 20 MHz Input 2 signals (f1, f2)	–14.5	–8.0	—	dBm	—

■ Electrical Characteristics (Reference values for design) at V_{CC} = 2.85 V

Notes) T_a = 25°C±2°C, fRX = 470 MHz, 620 MHz, 770 MHz, PRX = –30 dBm, CW unless otherwise specified.
The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection.
If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Conditions	Reference values			Unit	Notes
				Min	Typ	Max		
LNA AC electrical characteristics								
C-1	Power Gain HG	GH	High-Gain mode f = fRX	12.0	14.5	17.0	dB	—
C-2	Power Gain LG	GL	Low-Gain mode f = fRX, PRX = –20 dBm	–2.5	–1.5	—	dB	—
C-3	Noise Figure HG	NFH	High-Gain mode f = fRX	—	1.5	1.9	dB	*1
C-4	Noise Figure LG	NFL	Low-Gain mode f = fRX	—	1.5	2.5	dB	—
C-5	IIP3 +10 MHz offset HG	IIP3H1	High-Gain mode f1 = fRX + 10 MHz f2 = fRX + 20 MHz Input 2 signals (f1, f2)	–16.5	–8.0	—	dBm	—
C-6	IIP3 –10 MHz offset HG	IIP3H2	High-Gain mode f1 = fRX – 10 MHz f2 = fRX – 20 MHz Input 2 signals (f1, f2)	–17.0	–8.5	—	dBm	—
C-7	Input P1dB	IP1dBH	High-Gain mode f = fRX	–11	–5	—	dBm	—
C-8	Reverse Isolation HG	ISOH	High-Gain mode f = fRX	—	–24	–18	dB	—
C-9	Reverse Isolation LG	ISOL	Low-Gain mode f = fRX	—	–1.6	–1.0	dB	—
C-10	Input Return Loss HG	S11H	High-Gain mode f = fRX	5.0	9.5	—	dB	—
C-11	Input Return Loss LG	S11L	Low-Gain mode f = fRX	12	20	—	dB	—
C-12	Output Return Loss HG	S22H	High-Gain mode f = fRX	7	23	—	dB	—
C-13	Output Return Loss LG	S22L	Low-Gain mode f = fRX	10	12	—	dB	—
C-14	K-Factor	KH	High-Gain mode f = 300 kHz to 6 GHz	1.0	1.5	—	—	—
C-15	Switching Time	TSW	High-Gain mode → Low-Gain mode Low-Gain mode → High-Gain mode	—	3.2	10.0	µs	—

Note) *1 : Connector & pattern (evaluation PCB) loss (0.1 dB) included.

■ Control Pins Mode Table

Note) Control voltage range : See B No. DC-3 / B No. DC-4 at page 8

Pin No.	Descriptions	Voltage		Note
		Low	High	
3	High-Gain/Low-Gain Switching (Gain Control)	Low-Gain	High-Gain	—

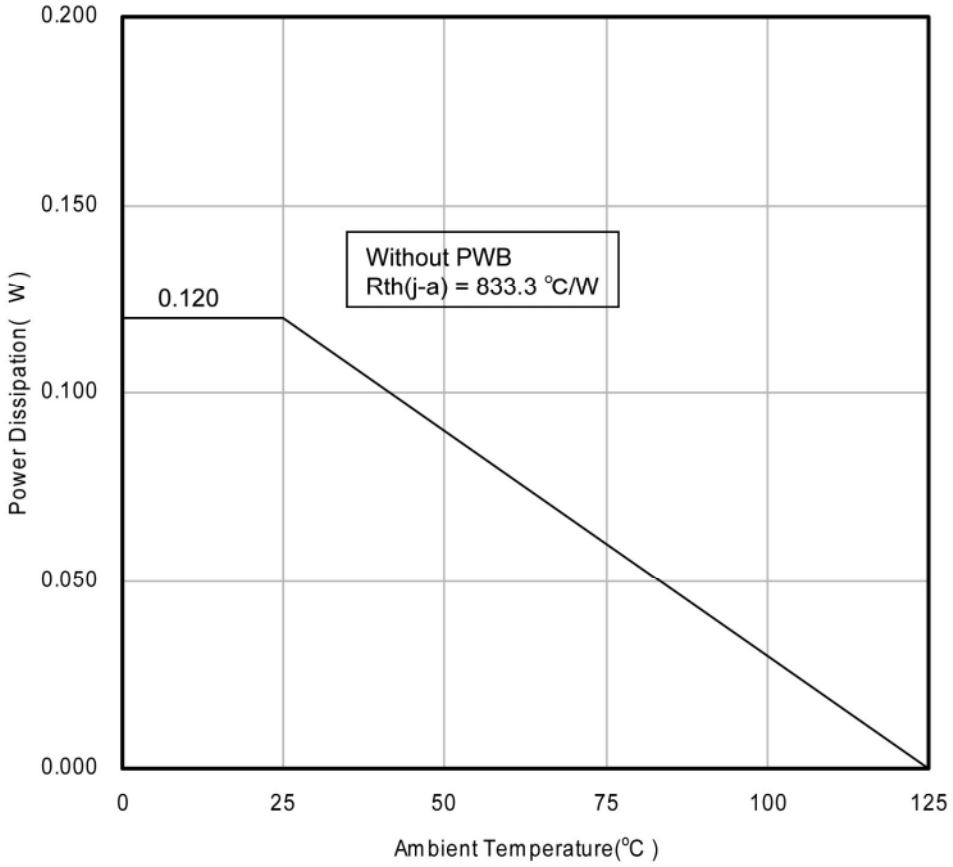
■ Truth Table

Note) Control voltage range : See B No. DC-3 / B No. DC-4 at page 8

CNT	LNA	Mode
High	High-Gain	High-Gain
Low	Low-Gain	Low-Gain

■ Technical Data

• P_D — T_a diagram



■ Usage Notes

• Special attention and precaution in using

1. This IC is intended to be used for general electronic equipment [cellular phones].
   Consult our sales staff in advance for information on the following applications:
   - Special applications in which exceptional quality and reliability are required, or if the failure or malfunction of this IC may directly jeopardize life or harm the human body.
   - Any applications other than the standard applications intended.
     (1) Space appliance (such as artificial satellite, and rocket)
     (2) Traffic control equipment (such as for automobile, airplane, train, and ship)
     (3) Medical equipment for life support
     (4) Submarine transponder
     (5) Control equipment for power plant
     (6) Disaster prevention and security device
     (7) Weapon
     (8) Others : Applications of which reliability equivalent to (1) to (7) is required

2. Pay attention to the direction of LSI. When mounting it in the wrong direction onto the PCB (printed-circuit-board), it might smoke or ignite.

3. Pay attention in the PCB (printed-circuit-board) pattern layout in order to prevent damage due to short circuit between pins. In addition, refer to the Pin Description for the pin configuration.

4. Perform a visual inspection on the PCB before applying power, otherwise damage might happen due to problems such as a solder-bridge between the pins of the semiconductor device. Also, perform a full technical verification on the assembly quality, because the same damage possibly can happen due to conductive substances, such as solder ball, that adhere to the LSI during transportation.

5. Take notice in the use of this product that it might break or occasionally smoke when an abnormal state occurs such as output pin-V_{CC} short (Power supply fault), output pin-GND short (Ground fault), or output-to-output-pin short (load short) .
   And, safety measures such as an installation of fuses are recommended because the extent of the above-mentioned damage and smoke emission will depend on the current capability of the power supply.

6. When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
   Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

7. When using the LSI for new models, verify the safety including the long-term reliability for each product.

8. When the application system is designed by using this LSI, be sure to confirm notes in this book.
   Be sure to read the notes to descriptions and the usage notes in the book.

Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

(2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.

(3) The products described in this book are intended to be used for general applications (such as office equipment, communications equipment, measuring instruments and household appliances), or for specific applications as expressly stated in this book.
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automotive equipment, traffic signaling equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.

It is to be understood that our company shall not be held responsible for any damage incurred as a result of or in connection with your using the products described in this book for any special application, unless our company agrees to your using the products in this book for any special application.

(4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

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